

REMARKS

Reconsideration of this Application is respectfully requested. Applicants have addressed every objection and ground for rejection stated in the present Office Action, and believe the Application is now in condition for allowance.

1. Statement of the Case and Status of the Claims.

The present invention is directed to a novel electrode active material represented by the nominal general formula:



wherein:

- (i) A is selected from the group consisting of elements from Group I of the Periodic Table, and mixtures thereof, and $0 < a \leq 9$;
- (ii) at least one of M, MII and MIII is a redox active element, $0 < m, n, o \leq 4$, and $\frac{1}{2}[V(MI) + V(MII)] = V(M)$, wherein V(M) is the valence state of M, V(MI) is the valence state of MI, and V(MII) is the valence state of MII;
- (iii) XY₄ is selected from the group consisting of X'[O_{4-x}, Y'_x], X'[O_{4-y}, Y'_{2y}], X''S₄, [X_z''', X'_{1-z}]O₄, and mixtures thereof, wherein:
 - (a) X' and X''' are each independently selected from the group consisting of P, As, Sb, Si, Ge, V, S, and mixtures thereof;
 - (b) X''' is selected from the group consisting of P, As, Sb, Si, Ge, V, and mixtures thereof;
 - (c) Y' is selected from the group consisting of a halogen, S, N, and mixtures thereof; and
 - (d) $0 \leq x \leq 3$, $0 \leq y \leq 2$, $0 \leq z \leq 1$, and $1 \leq d \leq 3$; and
- (iv) Z is selected from the group consisting of a hydroxyl (OH), a halogen, and mixtures thereof, and $0 \leq e \leq 4$;

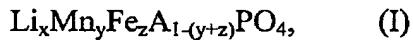
wherein A, M, MI, MII X, Y, Z, a, m, n, o, d, and e are selected so as to maintain electroneutrality of the compound.

Claims 1 - 83 are currently pending in the present Application and stand rejected. Upon entry of the present Amendment, Claims 1 - 83 will be cancelled, new Claims 84 - 170 will be added.

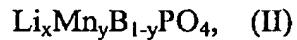
2. Rejection Under 35 U.S.C. §102(b)

Claims 1 - 6, 8 - 12, 14, 16, 18, 23 - 25, 28 - 31, 33 - 38, 40 - 44, 46, 48, 50, 55 - 57 and 60 - 63 currently stand rejected under 35 U.S.C. §102(b) as being anticipated by EP 1 150 367 A2 to Yamada et al. ("Yamada '367"). The rejected Claims have been cancelled, and replaced with new Claims 84 - 170. For the reasons set forth below, Applicants submit that Yamada '367 fails to teach or suggest the invention as set forth in the new Claims.

Yamada '367 discloses, among other things, an electrode material represented by the general formula (I):



wherein A is at least one metal element selected from Ti and Ag or is selected from Ti and Mg. (See, Yamada '367, paragraphs 24 and 28). Yamada also discloses an electrode material represented by the general formula (II):



wherein B denotes "plural" metal elements selected from among Ti, Fe, Zn, Mg and Co. (See, Yamada '367, paragraph 33).

Yamada '367 teaches the following general species as examples of compounds derivable from general formula (II): $\text{Li}_x\text{Mn}_y(\text{Ti, Co})_{1-y}\text{PO}_4$, $\text{Li}_x\text{Mn}_y(\text{Ti, Fe})_{1-y}\text{PO}_4$, $\text{Li}_x\text{Mn}_y(\text{Ti, Zn})_{1-y}\text{PO}_4$, $\text{Li}_x\text{Mn}_y(\text{Fe, Zn})_{1-y}\text{PO}_4$, $\text{Li}_x\text{Mn}_y(\text{Fe, Mg})_{1-y}\text{PO}_4$, $\text{Li}_x\text{Mn}_y(\text{Fe, Co})_{1-y}\text{PO}_4$, $\text{Li}_x\text{Mn}_y(\text{Zn, Mg})_{1-y}\text{PO}_4$, $\text{Li}_x\text{Mn}_y(\text{Zn, Co})_{1-y}\text{PO}_4$, and $\text{Li}_x\text{Mn}_y(\text{Mg, Co})_{1-y}\text{PO}_4$. (See, Yamada '367, paragraph 50).

Yamada '367 further teaches the following specific species as examples of compounds derivable from general formulas (I) and (II), $\text{LiMn}_{0.7}\text{Fe}_{0.2}\text{Ti}_{0.1}\text{PO}_4$ and $\text{LiMn}_{0.7}\text{Fe}_{0.25}\text{Mg}_{0.05}\text{PO}_4$. (See, Yamada '367, Examples 4, 5, 10 and 11).

In contrast, new independent Claim 84 recites, among other things, a battery comprising an electrode active material represented by the general formula (III):



wherein, among other things, *MI* is selected from the group consisting of Li^{I+} , K^{I+} , Na^{I+} , Ru^{I+} , Cs^{I+} , and mixtures thereof.

New independent Claim 103 recites, among other things, a battery comprising an electrode active material represented by general formula (III), wherein $0 < e \leq 1$.

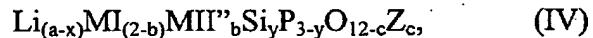
Finally, new independent Claim 139 recites, among other things, a battery comprising an electrode active material represented by general formula (III), wherein $d = 3$.

Accordingly, because Yamada '367 fails to teach or suggest Applicants' invention as claimed in new independent Claims 84, 130 and 139, Applicants respectfully submit that new independent Claims 84, 130 and 139, and all Claims depending there from, are patentably distinct from Yamada '367. Accordingly, Applicants respectfully request withdrawal of the Examiner's present rejection.

3. Rejection under 35 U.S.C. §103(a)

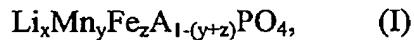
Claims 7, 13, 15, 17, 19 - 22, 26 - 27, 32, 39, 45, 47, 49, 51 - 54, 58, 59 and 64 - 83 stand rejected under 35 U.S.C. §103(a) as being unpatentable over Yamada '367, in view of U.S. Patent No. 6,153,333 to Barker et al. ("Barker '333"). The rejected Claims have been cancelled, and replaced with new Claims 84 - 170. For the reasons set forth below, Applicants submit that Yamada '367 and Barker '333, either alone or in combination, fail to teach or suggest the invention as set forth in the new Claims.

Barker '333 discloses, among other things, an electrode material having a *NASICON* structure and represented by the general formula (IV):



wherein, among other things, MI and MII are the same or different and are each elements independently selected from the group of metals and metalloid elements, and Z is a halogen. (See, Barker '333, col. 5, line 32 - col. 7, line 5).

As noted above, Yamada '367 discloses, among other things, an electrode material having an *olivine* structure and represented by the general formula (I):



wherein A is at least one metal element selected from Ti and Ag or is selected from Ti and Mg. (See, Yamada '367, paragraphs 24 and 28). Yamada also discloses an electrode material represented by the general formula (II):



wherein B denotes "plural" metal elements selected from among Ti, Fe, Zn, Mg and Co. (See, Yamada '367, paragraph 33).

In contrast, new independent Claim 84 recites, among other things, a battery comprising an electrode active material represented by the general formula (III):



wherein, among other things, MI is selected from the group consisting of Li^{I+} , K^{I+} , Na^{I+} , Ru^{I+} , Cs^{I+} , and mixtures thereof. New independent Claim 103 recites, among other things, a battery comprising an electrode active material represented by general formula (III), wherein $0 < e \leq 1$. Finally, new independent Claim 139 recites, among other things, a battery comprising an electrode active material represented by general formula (III), wherein $d = 3$.

The Examiner has asserted that "it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified the compound of EP '367 by replacing MI, Z, d, the first and second electrode, and [sic] electrolyte with the MI, Z, d, the first and second electrode and electrolyte of Barker because both are concerned with lithium phosphates of the same formula." (See, Paper No. 20050516, pg. 11, emphasis added). Applicants respectfully traverse the Examiner's assertion, and submit that the Examiner has failed to establish a *prima facie* case of obviousness.

Yamada '367 and Barker '333 are not concerned with lithium phosphates of the same formula or crystal structure. The electrode active materials of Yamada '367, as represented by general formulas (I) and (II) herein, have an olivine structure. (See, Yamada '367, col. 5, ll. 3). In contrast, electrode active materials of Barker '333, as represented by general formula (IV) herein, have a NASICON structure. (See, Barker '333, col. 14, ll. 14). Furthermore, Yamada's general formulas (I) and (II) clearly differ from Barker's general formula (IV). For example, general formulas (I) and (II) describe an olivine electrode active material having a phosphate-only polyanion moiety, whereas general formula (IV) describes a NASICON electrode active material having a phosphate/silicate polyanion moiety, wherein the oxygen of the polyanion moiety is stoichiometrically substituted with a halogen.

Furthermore, both references lack any teaching which would *suggest* to one with ordinary skill in the art to pick-and-choose from among the multitude of possible selections for M_I, M_{II}, Z, a, x, b, y and c of Barker's general formula (IV), then modify the electrode active materials described in Yamada '367 (or vice-versa), in order to arrive at Applicants' claimed electrode active materials. Stated differently, both references lack any teaching which would motivate one with ordinary skill in the art to pick-and-choose from among the multitude of possible substitutions for M_I, M_{II}, Z, a, x, b, y and c of Barker's general formula (IV), then pick pick-and-choose from among the possible substitutions for A, B, x, y and z of Yamada's general formulas (I) and (II), and then somehow combine those teachings in order to arrive at Applicants' claimed electrode active materials.

In addition, Applicants submit that one with ordinary skill in the art would not presume the advantages of doping the various moieties of the NASICON structures of Barker '333 would similarly apply to other crystal structures such as the olivine structures of Yamada '367 (or vice-versa), absent some teaching or suggestion to the contrary.

Finally, the Examiner has failed to specifically identify any teaching or suggestion in either reference which would motivate one with ordinary skill in the art to modify the Yamada active materials (as represented herein by general formulas (I) and (II)) based on the teachings of Barker '333 (or vice-versa), in order to arrive at Applicants' claimed active materials. For this reason alone, Applicants submit the Examiner has failed to establish a *prima facie* case of obviousness.

Accordingly, based on the remarks stated above, Applicant submits that new Claims 84 - 170 are patentable over Yamada '367 and Barker '333, both individually and in combination. Accordingly, Applicant respectfully requests withdrawal of the present rejection.

4. Summary

In view of the remarks presented herein, Applicants submit that all objections and grounds for rejection stated in the present Office Action have been overcome.

Accordingly, Applicants respectfully submit that Claims 84 - 170 are allowable over the prior art of record. Should anything further be required, the Examiner is respectfully requested to telephone the undersigned at 702-558-1071.

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Respectfully submitted,

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